



## LS™ 450 SONIC DRILL RIG

# LS™450 SONIC RIG

The new LS™450 drill is a compact rig perfect for a wide variety of projects in environmental, geotechnical, water, and mining. Featuring the power and precision of the large-format series rigs, the LS450 brings our innovative head technology to an industry proven compact, track-mounted platform.

## Unmatched Versatility and Reliability

The LS450 is the perfect rig for a wide variety of soft ground, shallow drilling projects including environmental, tunneling, water management, grade control, and leach pads. Faster penetration, nearly undisturbed samples using little or no fluids, and its casing advancement system make the LS450 ideal for a variety of applications.

*Mining* - The mining industry benefits from extremely accurate sampling of unconsolidated formations. Heap leach and tailing pad sampling, monitoring well installation and water sampling, dewatering applications, and wireline sampling are all examples of possible mining applications.

*Environmental and Geotechnical* - By continually casing the borehole and using little to no fluid, the LS450 eliminates the risk of cross contamination and is ideal for environmental and geotechnical work.

*Infrastructure* - Precisely drilling straight holes at varying angles makes the LS450 ideal for infrastructure projects.

## Compact, Low Cost Solution

The wide 600 mm rubber tracks provide low ground pressure (0.3 bar/4psi), perfect for jobs in the most sensitive and fragile terrains. The compact, smaller footprint makes it versatile for small drill pads, environmentally sensitive areas, or hard to reach sites. It also requires less support equipment for a smaller drill pad and an overall lower cost solution.

## Operator Safety and Comfort

The LS450 features a rod presenter where rod and casing can be loaded horizontally and an actuator then presents the rod and casing vertically to the head. The head rotates 28 degrees to the side for sample extraction. Head slide shift allows for unobstructed winch use down the hole.

The interlocked rotation barrier slows rotation when the barrier is open, providing additional operator safety. The LS450 is also available with full CE certification (Machinery Directive 2006/42/EC) according to the latest EN16228 safety standards.

The LS450 mast articulation and wiggle tail enables the mast to shift from left to right and front to back to position the mast precisely over the hole, eliminating time consuming rig movements. The dump mast allows the crew to work from the ground, safety is enhanced by avoiding stairs and safety rails often required when working from a platform. The mast articulation allows for drilling at angles from 90 to 45 degrees.

\*Sound levels recorded manually using an Extech Instruments device Hand Held Sound Level Meter model #407730.

## 1 ENHANCED SAFETY

Interlocked rotation barrier - rotation slows when open for enhanced safety.

## 2 COMPACT FOOTPRINT

Fits in shipping container and makes the LS450 perfect for smaller drill pads. Short mast option available for low overhead clearance applications.

## 3 ENHANCED SAFETY

Rod presenter allows the casing to be loaded horizontally.

## 4 EASY OPERATION AND MAINTENANCE

Pilot operated hydraulic system is easy to operate and maintain.





## 5 INCREASED PRECISION

Eliminate time consuming rig moves with the mast articulation and wiggle tail which allows the mast to shift from left to right and front to back to position the mast precisely over the hole. The mast articulation allows for drilling from 90 to 45 degrees.

## 6 HIGH EFFICIENCY ROTATION AND OSCILLATION UNIT

Tilting head facilitates rod manipulation for faster cycle times. Patented airbag system isolates the vibration from the rig and transfers it down the hole for more efficient drilling.

## 7 INCREASED ACCESSIBILITY

Wide track mounted and low ground pressure (0.3 bar/4 psi) – perfect for increased accessibility in the most sensitive and fragile terrains.



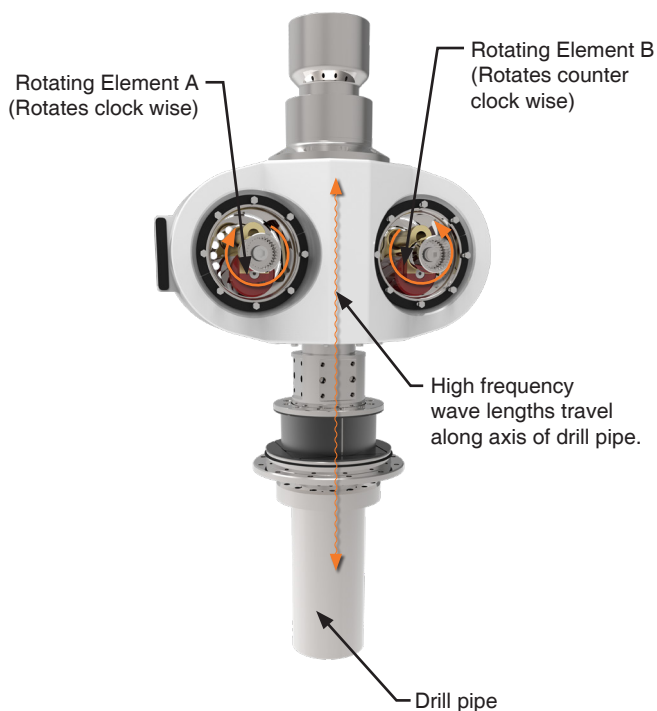
## HOW SONIC DRILLING WORKS

Drilling with the LS450 rig employs the use of high-frequency, resonant energy to advance a core barrel or casing into subsurface formations. During drilling, the resonant energy is transferred down the drill string to the bit face at various sonic frequencies. Simultaneously rotating the drill string evenly distributes the energy and impact at the bit face.

The resonant energy is generated inside the sonic head by two counter-rotating weights. A patented pneumatic isolation system inside the head prevents the resonant energy from transmitting to the drill rig and preferentially directs the energy down the drill string.

The driller controls the resonant energy generated by the sonic oscillator to match the formation being encountered to achieve maximum drilling productivity. When the resonant sonic energy coincides with the natural frequency of the drill string, resonance occurs. This results in the maximum amount of energy being delivered to the face. At the same time, friction of the soil immediately adjacent to the entire drill string is substantially minimized, resulting in very fast penetration rates.

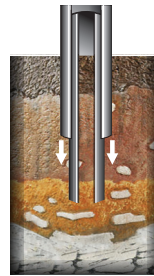
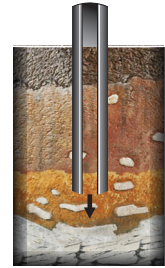
### SONIC OSCILLATOR DIAGRAM



## TYPICAL SONIC DRILLING PROCEDURE:

### STEP 1 - CORE BARREL ADVANCEMENT

Sonically advance core barrel into the undisturbed formation. No air, mud, or water is used in the coring process.



### STEP 2 - CASING OVERRIDE

Sonically override a larger diameter casing over the core barrel.



### STEP 3 - CORE RETRIEVAL

Return the core barrel to the surface for sample extraction.



### STEP 4 - REPEAT CORE ADVANCEMENT

Complete coring and overriding casing to desired depth.

## SONIC BOREHOLE ADVANCEMENT

The LS450 advances a casing as the borehole is drilled. While there are several ways to drill a borehole with the sonic drilling method (depending upon site-specific conditions and project objectives), the most common way involves advancing a core barrel, which is overridden by a larger diameter drill string that cases the open borehole and prevents collapse.

### The LS450 Sonic Rig offers:

- Core sizes of 3.75" through 8"
- Standard borehole sizes of 3" though 12"
- Drilling depth of up to 139 meters / 455 feet





# THE LEADER IN SONIC DRILLING TECHNOLOGY

Whether you're drilling for environmental water supply development, geo-construction, geotechnical, or mineral exploration, the LS450 rig offers several distinct advantages over conventional rigs, including:

## MINIMAL DRILL DEVIATION

### Superior Information

The LS450 provides a continuous, relatively undisturbed core sample of unparalleled quality and accuracy through any type of formation. When using the iso-flow groundwater profiling system, hydrogeological and geochemical data can be easily obtained.

## 80% REDUCED WASTE

### Waste Reduction

Drilling with the LS450 reduces waste by up to 80% relative to conventional drilling.

### Superior Well Construction

Sonic drilling causes minimal disturbance to the surrounding borehole wall, resulting in more efficient well development and performance.

### Speed

Sonic drilling is faster than conventional overburden drilling methods.

### Risk Minimization

Sonic drilling greatly reduces the risk of project failure due to unknown or difficult subsurface conditions.

### Cost Effective

The LS450 rig offers the most cost-effective solution when compared to other conventional drilling methods. The smaller footprint makes it versatile, easy to transport, and it requires less support equipment for an overall lower cost solution.

### Flexibility

Sonic drilling advances a temporary outer casing as the borehole is drilled, allowing more to be accomplished with a single borehole.



# LS™ 450 SONIC TECHNICAL INFORMATION

General Performance Rating			
		Metric	U.S.
Drilling Depth* *Depths based on normal drilling conditions. Varying ground conditions and drilling styles may vary results.	4.75 in (121 mm)	139 m	455 ft
	6 in (152 mm)	122 m	400 ft
	7 in (178 mm)	113 m	370 ft
	8 in (203mm)	107 m	350 ft
	9.25 in (235 mm)	101m	330 ft
	10.5 in (267 mm)	95 m	310 ft
	12 in (305 mm)	91 m	300 ft
Max Drilling Diameter		305 mm	12 in
Pull Back		66 kN	14,800 lbf
Down Force		24 kN	5,300 lbf
Max Casing Length		3 m	10 ft
Sonic Head			
		Metric	U.S.
Drill Head Type		BL-150	
Vibration Motors		Fix displacement piston motors	
Frequency Range		0-150 Hz	
Output Force @ 150 Hz		222 kN	50,000 lbs
Maximum Torque		3,660 Nm	2,700 ft/lb
Rotation Speed		0 - 80 RPM	
Prime Mover			
		Metric	U.S.
Engine - Standard Unit		Cummins B4.5, 4 cylinder, turbo charged, diesel engine	
Displacement		4.5 L	272 in³
Power (maximum) at		149 kW	200 hp
Emissions (Option)		Stage V	Tier 4 Final
Fuel Tank Capacity		193 L	51 gal
Drill Mast System			
		Metric	U.S.
Drilling Angle		45° off horizontal to 90° vertical down	
Standard Mast Head Travel		4.0 m	13 ft 2 in
Head Rotation		0 - 28 Degrees	



# LS™ 450 SONIC TECHNICAL INFORMATION

Main Winch		
	Metric	U.S.
Line Pull		
Bare Drum	11,000 N	2,472 lb
Full Drum	9,000 N	2,023 lb
Rope speed		
Bare Drum	27.5 m/min	90 ft/min
Full Drum	34 m/min	111.5 ft/min
Main line winch cable dia.	8 mm	5/16 in
Rope length	65 m	213 ft
Foot Clamp/Breakout System		
	Metric	U.S.
Rod Clamps	2 (dual cylinders - top and bottom)	
Max clamping diameter (clamp/breakout tool)	305 mm	12 in
Clamping force	129 kN	29,000 lb
Max breaking torque	23 kNm	17,000 lbft
Max breaking angle	20 degrees	
Undercarriage		
	Metric	U.S.
Crawler - Standard Unit	Rubber Tracks	
Max speed	6.25 km/h	3.9 m/h
Track width	600 mm	24 in
Ground pressure	.28 bar	4.0 PSI



# LS™ 450 SONIC TECHNICAL INFORMATION

Water Pump		
	Metric	U.S.
Type E04 (Option)	FMC E0413	
Max flow	80 lpm	21.1 gpm
Max pressure	41 bar	595 PSI
Type L09 (Option)	FMC LO918	
Max flow	108 lpm	28.7 gpm
Max pressure	48 bar	700 PSI
Type W11 (Option)	FMC W1122	
Max flow	201 lpm	53 gpm
Max pressure	69 bar	1000 PSI
Grout Pump		
	Metric	U.S.
Type	SPX40 Hose Pump	
Max flow	160 lpm	42 gpm
Max pressure	16 bar	232 PSI



## ADDITIONAL OPTIONS

Welder Generator		
	Metric	U.S.
Type	Hydraulic driven Getec	
Generator		
Voltage	120 V	
Frequency	60 Hz	
Power	4,000 W	5.36 hp
Welder		
Current	200 A	
Voltage	12 - 30 V	
Duty cycle	68%	
Welder Generator - European Version		
	Metric	U.S.
Generator		
Voltage	230 V / 400 V	
Frequency	50 Hz	
Power 230 V	3,500 W	4.7 hp
Power 400 V	6,500 W	8.7 hp
Welder		
Current	180 A	
Voltage	22 - 32 V	
Duty cycle @180 A	50%	
Duty cycle @110 A	100%	
Autohammer (Standard Penetration Test)		
	Metric	U.S.
Impact rate	1 - 30 blows/minute	
Hammer size	63,5 kg	140 lb
Hammer drop height	762 mm	30 in
Max pressure	124 bar	1800 PSI
Max flow	60 lpm	15.9 gpm
All up weight	226 kg	498 lb
Certified hammer efficiency	64 - 72%	64 - 72%

# LS™ 450 SONIC TECHNICAL INFORMATION

## Measurements

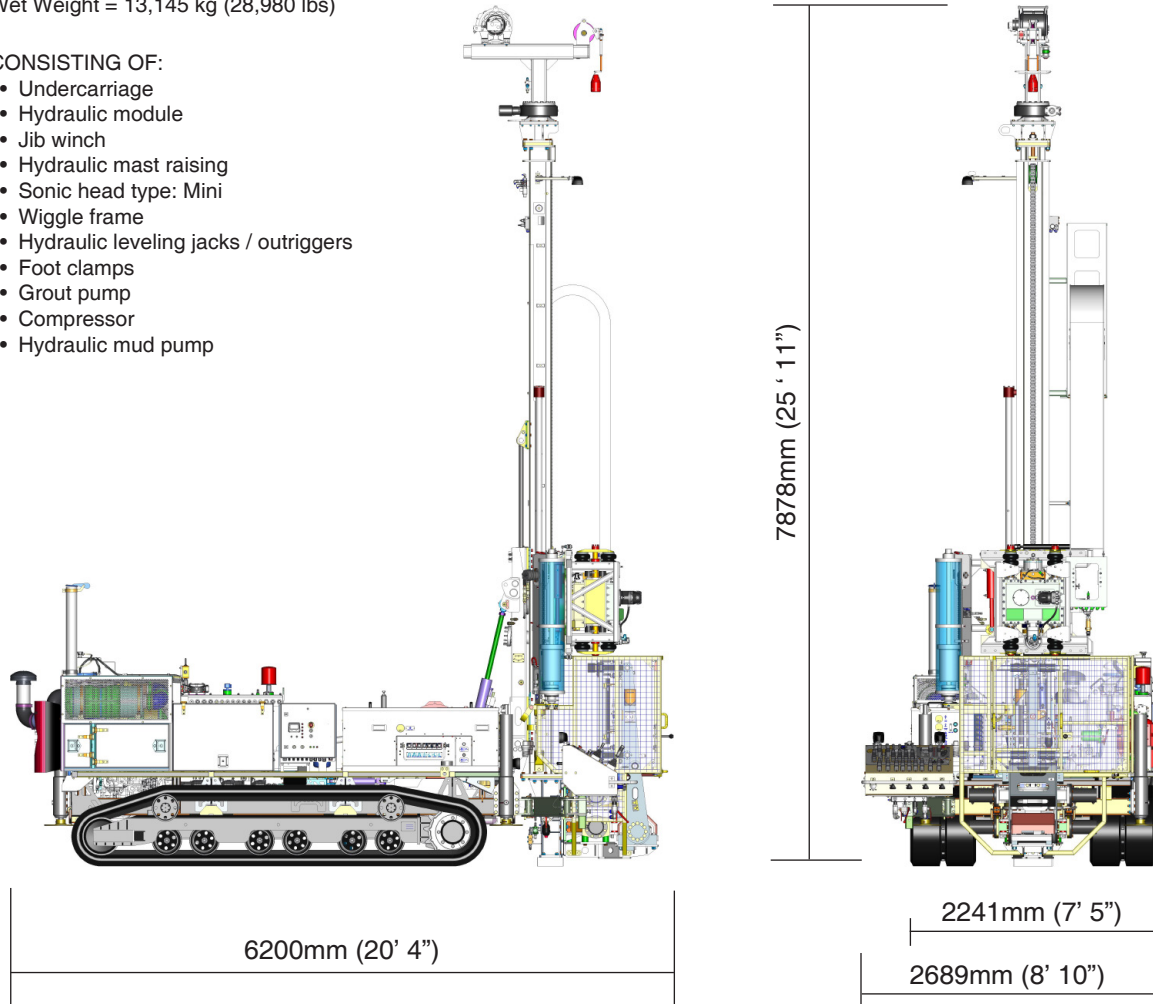
### Standard Mast - Drilling Position

Dry Weight = 12,931 kg (28,500 lbs)

Wet Weight = 13,145 kg (28,980 lbs)

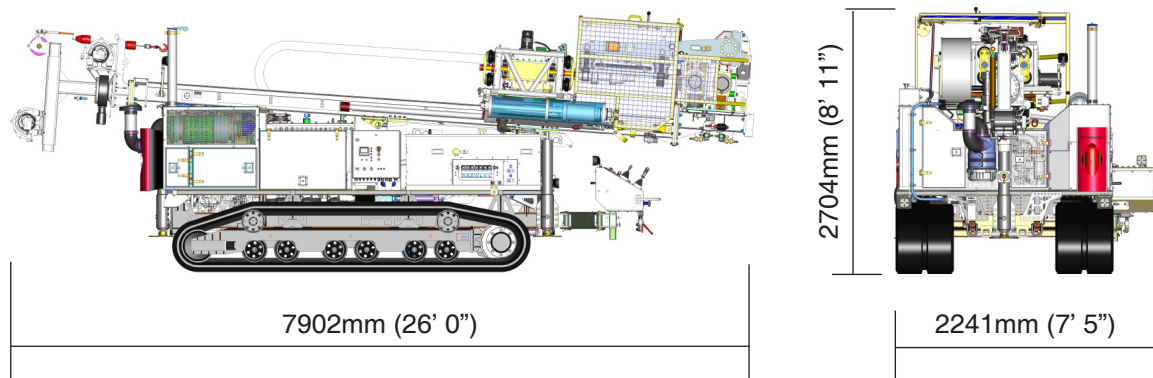
#### CONSISTING OF:

- Undercarriage
- Hydraulic module
- Jib winch
- Hydraulic mast raising
- Sonic head type: Mini
- Wiggle frame
- Hydraulic leveling jacks / outriggers
- Foot clamps
- Grout pump
- Compressor
- Hydraulic mud pump



## Measurements

### Standard Mast - Travel Position





# SONIC TOOLING



## RODS AND CASING

Boart Longyear's sonic drill rods, core barrels and casing feature a heat-treated pin and box, dramatically increasing wear-resistance and life of rods.

- Casing in diameters of 4.75" - 12"
- Core barrels in diameters of 3.75" - 10.5"
- 10' Upset Forged Drill Rod (one piece construction)



## BITS AND SHOES

Boart Longyear offers a full line of sonic bits and shoes for use in varying ground conditions and applications. Core barrel bits and casing shoes use high-grade tungsten carbide inserts and premium steel for increased strength and toughness.



## ACCESSORIES

Boart Longyear offers a full line of accessories and consumables for use with the LS450. State-of-the-art manufacturing techniques and facilities, coupled with stringent quality control ensure each product produced meets the highest standard of quality.





## SONIC HEAD SERVICE EXCHANGE PROGRAM

The Boart Longyear Service Exchange program offers a great alternative to waiting for a sonic head in need of repair or rebuild. With the service exchange program, there's no waiting for shipping transit times or while the head is being rebuilt or repaired.

### Here's how it works:

1. Buy a certified rebuilt sonic head (with warranty) at 85% of the cost of a new head. Remanufactured heads ship from stock.
2. Receive a certified rebuilt sonic head (warranty included) – without having to wait for the repairs or rebuild to the original sonic head.
3. Return the serviceable sonic head core to Boart Longyear.
4. Receive a sonic head core credit of up 20% (upon inspection and authorization).

Designed to minimize turnaround times and lower costs for repairs, the service exchange allows you to get a certified rebuilt (under warranty) head faster and start drilling again.

## GENUINE BOART LONGYEAR™ PARTS

Each Boart Longyear rig is strategically designed to be the most rugged and reliable equipment in the field. So every part is designed and built to precise specifications made from the most durable and high-quality materials. Maintain this quality and maximize efficiency and asset lifecycle by ordering genuine Boart Longyear parts.

### REQUEST A QUOTE

Request a quote today from your local Boart Longyear representative or by visiting:

[www.boartlongyear.com/LS450](http://www.boartlongyear.com/LS450)



# SONIC SAMPLES





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